AMENDMENTS TO THE CLAIMS

The claims in this listing will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) A direction of arrival estimator comprising:

an array antenna made up of a plurality of antenna elements that receives a signal as a reception signal from a communication terminal apparatus, the array antenna comprising a plurality of antenna elements;

<u>a</u> first correlation <u>detecting means for calculating detector that calculates</u> a cyclic correlation matrix using a <u>first</u> cycle frequency of a first modulated signal <u>that is</u> included in the reception signal of said array antenna;

<u>a</u> second correlation <u>detecting means for calculating detector that calculates</u> a cyclic correlation matrix using a <u>second</u> cycle frequency of a second modulated signal whose modulation system is different from <u>that a modulation system</u> of said first modulated signal <u>included in the reception signal of said array antenna</u>; and

<u>a</u> direction of arrival <u>estimating means for estimating estimator that estimates</u> the directions of arrival of said first modulated signal and said second modulated signal using eigenvalues and eigenvectors of the correlation matrices calculated by said first and second correlation <u>detecting means</u> <u>detectors</u>.

2. (Currently Amended) The direction of arrival estimator according to claim 1, wherein, when the reception signal contains a known spread spectrum modulated signal, the first correlation detecting means detector calculates a cyclic correlation matrix of a spread spectrum modulated signal using a frequency decided from the chip rate of the

<u>known</u> spread spectrum modulated signal as the <u>first</u> cycle frequency <u>of the first</u> modulated signal.

- 3. (Currently Amended) The direction of arrival estimator according to claim 1, wherein the second correlation detecting means detector calculates a cyclic correlation matrix of the second modulated signal by detecting the second cycle frequency of the second modulated signal from the reception signal.
- 4. (Currently Amended) The direction of arrival estimator according to claim 2, further comprising <u>a</u> data storing means for storing storage that stores the reception signal, wherein the first correlation detecting means detector calculates a cyclic correlation matrix using the storage data of stored in said data storing means storage.
- 5. (Currently Amended) The direction of arrival estimator according to claim 1, wherein, when there is a plurality of eigenvalues, the direction of arrival estimating means estimator uses absolute values of said igenvalues eigenvalues to distinguish magnitudes thereof of the eigenvalues.
- 6. (Currently Amended) The direction of arrival estimator according to claim 1, wherein the second correlation detecting means detector detects a plurality of cyclic frequencies from the reception signal and calculates a cyclic correlation matrix of a plurality of second modulated signals.
 - 7. (Canceled)
- 8. (Currently Amended) A base station apparatus equipped with a direction of arrival estimator, said direction of arrival estimator comprising:

an array antenna made up of a plurality of antenna elements that receives a signal as a reception signal from a communication terminal apparatus, the array antenna comprising a plurality of antenna elements;

<u>a</u> first correlation detecting means for calculating detector that calculates a cyclic correlation matrix using a first cycle frequency of a first modulated signal that is included in the reception signal of said array antenna;

<u>a</u> second correlation <u>detecting means for calculating detector that calculates</u> a cyclic correlation matrix using a <u>second</u> cycle frequency of a second modulated signal whose modulation system is different from <u>that the modulation system</u> of said first modulated signal <u>included in the reception signal of said array antenna</u>; and

<u>a</u> direction of arrival <u>estimating means for estimating estimator that estimates</u> the directions of arrival of said first modulated signal and said second modulated signal using eigenvalues and eigenvectors of the correlation matrices calculated by said first and second correlation <u>detecting means detectors</u>.

9. (Currently Amended) A direction of arrival estimation method comprising the steps of:

calculating a cyclic correlation matrix using a first cycle frequency of a first modulated signal received by an array antenna;

calculating a cyclic correlation matrix using a second cycle frequency of a second modulated signal whose modulation system is different from that the modulation system of said the first modulated signal received by said array antenna; and

estimating the directions of arrival of said the first modulated signal and said the second modulated signal using eigenvalues and eigenvectors of said the calculated correlation matrices.

- 10. (New) The direction of arrival estimator according to claim 8, wherein, when the reception signal contains a known spread spectrum modulated signal, the first correlation detector calculates a cyclic correlation matrix of a spread spectrum modulated signal using a frequency decided from the chip rate of the known spread spectrum modulated signal as the cycle frequency of the first modulated signal.
- 11. (New) The direction of arrival estimator according to claim 8, wherein the second correlation detector calculates a cyclic correlation matrix of the second modulated signal by detecting the cycle frequency of the second modulated signal from the reception signal.
- 12. (New) The direction of arrival estimator according to claim 10, further comprising a data storage that stores the reception signal, wherein the first correlation detector calculates a cyclic correlation matrix using the data stored in said data storage.
- 13. (New) The direction of arrival estimator according to claim 8, wherein, when there is a plurality of eigenvalues, the direction of arrival estimator uses absolute values of said eigenvalues to distinguish magnitudes of the eigenvalues.
- 14. (New) The direction of arrival estimator according to claim 8, wherein the second correlation detector detects a plurality of cyclic frequencies from the reception signal and calculates a cyclic correlation matrix of a plurality of second modulated signals.

- 15. (New) The direction of arrival estimation method according to claim 9, wherein, when the reception signal contains a known spread spectrum modulated signal, the first calculation calculates a cyclic correlation matrix of a spread spectrum modulated signal using a frequency decided from the chip rate of the known spread spectrum modulated signal as the cycle frequency of the first modulated signal.
- 16. (New) The direction of arrival estimating method according to claim 9, wherein the second calculation calculates a cyclic correlation matrix of the second modulated signal by detecting the cycle frequency of the second modulated signal from the reception signal.
- 17. (New) The direction of arrival estimator according to claim 15, further comprising storing data of the reception signal, wherein the first calculation calculates a cyclic correlation matrix using the stored data.
- 18. (New) The direction of arrival estimator according to claim 9, wherein, when there is a plurality of eigenvalues, the estimating comprises using absolute values of the eigenvalues to distinguish magnitudes of the eigenvalues.
- 19. (Currently Amended) The direction of arrival estimator according to claim 9, wherein the second calculation detects a plurality of cyclic frequencies from the reception signal and calculates a cyclic correlation matrix of a plurality of second modulated signals.